IN THE SPECIFICATION

Please amend the specification, as follows:

Page 1, Lines 6-11

--This application claims the benefit of US Provisional Patent Applications, Serial No. 60/410,541 ~~(CiDRA Docket No. CC-543)~~, filed Sept. 12, 2002, and is a continuation-in-part of US Patent Applications, Serial No. 10/645,689 ~~(CiDRA Docket No. CC-0648)~~, filed Aug. 20, 2003, and is a continuation-in-part of US Patent Application, Serial No. 10/645,686 ~~(CiDRA Docket No. CC-0649)~~, filed Aug. 20, 2003, each of which are incorporated herein by reference in their entirety.--

Page 1, Lines 13-16

--US Patent Application Serial No. . 10/661,234 ~~(CiDRA Docket No. CC-0648A)~~, and Application Serial No. 10/661,082 ~~(CiDRA Docket No. CC-0650)~~, filed contemporaneously herewith, contains subject matter related to that disclosed herein, which is incorporated by reference in its entirety.--

Page 2, Lines 13-19

--According to the present invention, an optical identification element having a synthesized chemical attached thereto, comprises an optical substrate having at least one diffraction grating disposed therein, the grating having a resultant refractive variation at a grating location, the grating being embedded within a substantially single material of the optical substrate; the grating providing an output optical signal indicative of a code when illuminated by an incident light signal propagating in free space, the code identifying at least one of the element and said chemical, the output signal being a result of passive, non-resonsant scattering from the grating when illuminated by the incident light signal; and the synthesized ~~attached to a chemical, comprises an optical substrate; at least a portion of the substrate having at least one diffraction grating disposed therein, the grating having at least one refractive index pitch superimposed at a common location; the grating providing an output optical signal when illuminated by an incident light signal; the optical output signal being indicative of a code in the substrate; and the~~ chemical being attached to the substrate.--

Page 1, Lines 23-25

--A common form of chemical synthesis in combinatorial chemistry is known as "solid phase" chemical synthesis. This synthesis technique uses encoded beads or particles as a solid support for the synthesis of chemicals and/or ~~and or~~ chemical libraries--

Page 4, Lines 3-4

--Fig. 7 is a graph showing a ~~an~~ digital representation of bits in a code in an optical identification element, in accordance with the present invention.--

Page 9, Lines 8-16

--Next, a step 808 tests to see if the chemical synthesis is complete for each bead. If not the process goes back to step 803 where the remaining beads are recombined ~~recombines~~ or re-pooled ~~re-pools~~ and the process starts again. The loop 814 repeats a predetermined number of times N, where each time through the loop 814 another chemical is added to each of the beads. If certain beads are to have fewer chemicals than others, then certain beads will drop out of the process before others. When the step 808 concludes that one or more beads have completed their synthesis process, a step 812 logs the completion of that bead and the remainder of the beads continue until all desired chemicals have synthesized on the beads.--

Page 16, Lines 10-15

--Referring to Fig. 8, illustrations (a)-(c), for the grating 12 in a cylindrical substrate 10 having a sample spectral 17 bit code (i.e., 17 different pitches $\Lambda 1$-$\Lambda 17$), the corresponding image on the CCD (Charge Coupled Device) camera 60 is shown for a digital pattern 17 bit locations 89, including Figure 8, illustrations (b), (c) and (d), respectively, of 7 bits turned on (10110010001001001); 9 bits

turned on of (11000101010100111); <u>and</u> all 17 bits turned on of (11111111111111111).--

<u>Page 18, Line 20, to Page 19, Line 4</u>

--In Fig. 10, the bits may be detected by continuously scanning the input wavelength. A known optical source 300 provides the input light signal 24 of a coherent scanned wavelength input light shown as a graph 304. The source 300 provides a sync signal on a line 306 to a known reader 308. The sync signal may be a timed pulse or a voltage ramped signal, which is indicative of the wavelength being provided as the input light 24 to the substrate 10 at any given time. The reader 308 may be a photodiode, CCD camera, or other optical detection device that detects when an optical signal is present and provides an output signal on a line 309 indicative of the code in the substrate 10 or of the wavelengths present in the output light, which is directly related to the code, as discussed herein. The grating 12 reflects the input light 24 and provides an output light signal 310 to the reader 308. The wavelength of the input signal is set such that the reflected output light 310 <u>through an optical lens 321</u> will be substantially in the center 314 of the Bragg envelope 200 for the individual grating pitch (or bit) being read.--

Page 20, Lines 19-24

--In this case, rather than having the input light 24 coming in at the conventional Bragg input angle θi, as discussed hereinbefore and indicated by a dashed line 701, the grating 12 is illuminated with the input light 24 oriented on a line 705 orthogonal to the longitudinal grating vector 703 ~~705~~. The input beam 24 will split into two (or more) beams of equal amplitude, where the exit angle θ_o can be determined from Eq. 1 with the input angle θ_i=0 (normal to the longitudinal axis of the grating 12). --

Page 23, Line 20, to Page 24, Line 5

--Referring to Fig. 16, instead of using an optical binary (0-1) code, an additional level of multiplexing may be provided by having the optical code use other numerical bases, if intensity levels of each bit are used to indicate code information. This could be achieved by having a corresponding magnitude (or strength) of the refractive index change (δn) for each grating pitch Λ. Four intensity ranges are shown for each bit number or pitch Λ, providing for a Base-4 code (where each bit corresponds to 0,1,2, or 3). The lowest intensity level, corresponding to a 0, would exist when this pitch Λ is not present in the grating 12. The next intensity level 450 would occur when a first low level δn1 exists in the grating that provides an output signal within the intensity range corresponding to a 1. The next intensity level 452 would occur when a second higher level δn2 exists in the grating 12 that provides an output signal within the intensity range corresponding to a 2. The next intensity level 454 ~~452~~, would occur when a third

higher level $\delta n3$ exists in the grating 12 that provides an output signal within the intensity range corresponding to a 3.--

Page 25, Line 20 to Page 26, Line 4

--Referring to Fig. 18, if the value of n1 in the grating region 20 is greater than the value of n2 in the non-grating region 18, the grating region 20 of the substrate 10 will act as a known optical waveguide for certain wavelengths. In that case, the grating region 20 acts as a "core" along which light is guided and the outer region 18 acts as a "cladding" which helps confine or guide the light. Also, such a waveguide will have a known "numerical aperture" (θna) that will allow light 630 that is within the aperture θna to be directed or guided along the grating axis 207 and reflected axially off the grating 12 and returned and guided along the waveguide. In that case, the grating 12 will reflect light having the appropriate wavelengths equal to the pitches Λ present in the grating 12 back along the region 20 (or core) of the waveguide, and pass the remaining wavelengths of light as the light 632. Thus, having the grating region 20 act as an optical waveguide for wavelengths reflected by the grating 12 allows incident light that is not aligned exactly with the grating axis 207 to be guided along and aligned with the grating 12 axis 207 for optimal grating reflection.--

Page 30, Line 25, to Page 31, Line 14

--Referring to Fig. 28, illustrations (a), (b), (c), (d), and (e) the substrate 10 may have one or more holes located within the substrate 10. In illustration (a), holes 560 may be located at various points along all or a portion of the length of the substrate 10. The holes need not pass all the way through the substrate 10. Any number, size and spacing for the holes 560 may be used if desired. In illustration (b), holes 572 may be located very close together to form a honeycomb-like area of all or a portion of the cross-section. In illustration (c), one (or more) inner hole 566 may be located in the center of the substrate 10 or anywhere inside of where the grating region(s) 20 are located. The inner hole 566 may be coated with a reflective coating 573 to reflect light to facilitate reading of one or more of the gratings 12 and/or to reflect light diffracted off one or more of the gratings 12. The incident light 24 may reflect off the grating 12 in the region 20 and then reflect off the surface 573 to provide output light 577. Alternatively, the incident light 24 may reflect off the surface 573, then reflect off the grating 12 and provide the output light 575. In that case the grating region 20 may run axially or circumferentially 571 around the substrate 10. In illustration (d), the holes 579 may be located circumferentially around the grating region 20 or transversely across the substrate 10. In illustration (e), the grating 12 may be located circumferentially around the outside of the substrate 10, and there may be holes 574 inside the substrate 10. In that case, the incident light 24 reflects off the grating 12 to provide the optical light 576.--

Page 32, Lines 1-3

--Referring to Fig. 31, at least a portion of a side of the substrate 10 may be coated with a reflective coating 514 to allow incident light 510 to be reflected back to the same side from which the incident light came, as indicated by reflected light 512.--

Page 32, Lines 4-14

--Referring to Fig. 32, illustrations (a) and (b), alternatively, the substrate 10 can be electrically and/or magnetically polarized, by a dopant or coating, which may be used to ease handling and/or alignment or orientation of the substrate 10 and/or the grating 12, or used for other purposes. Alternatively, the bead may be coated with conductive material, e.g., metal coating on the inside of a holey ~~holy~~ substrate, or metallic dopant inside the substrate. In these cases, such materials can cause the substrate 10 to align in an electric or magnetic field. Alternatively, the substrate can be doped with an element or compound that fluoresces or glows under appropriate illumination, e.g., a rare earth dopant, such as Erbium, or other rare earth dopant or fluorescent or luminescent molecule. In that case, such fluorescence or luminescence may aid in locating and/or aligning substrates.--